PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference NEXT1PCT/P2491PC00	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/FI 03/00934	International filing date *(day/month/year)* 05.12.2003	Priority date *(day/month/year)* 05.12.2002
International Patent Classification (IPC) or national classification and IPC C03B37/018		
Applicant NEXTROM HOLDING S.A. et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *sent to the applicant and to the International Bureau)* a total of 4 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
05.05.2004	21.02.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer De Ruiter, F Telephone No. +49 89 2399-2921

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/FI 03/00934

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-27	as published

Claims, Numbers

11 (part), 12-18	as published
1-10, 11 (part), 19-34	received on 19.01.2005 with letter of 14.01.2005

Drawings, Sheets

1/9-9/9	as published

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-16,18-34
	No:	Claims	1,17
Inventive step (IS)	Yes:	Claims	
	No:	Claims	2-16,18-34
Industrial applicability (IA)	Yes:	Claims	1-34
	No:	Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

1. The method of claim 1 is known from US-A-4 174 842 (D1; see especially figures 1 and 2 and the related portions of the description), from JP-A-57/140330 (D2; see the summary) and also from US-B-6 192 715 (D3; see figures 4 and 7 and the related portions of the description). Consequently, the method of claim 1 does not meet the requirements of Article 33(2) PCT.

   It should be noted that, although the above documents do not mention the diffusion, or diffusion barriers, the features of the methods disclosed therein are exactly the same as those defined in claim 1. It also should be noted that, in asserting novelty and inventive step of a claim, the broadest meaning of the wording of this claim has to be considered, and no limiting features can be interpreted from the description or the, eventually following, dependent claims into this claim.

   It is also to be noted that the maintaining of the concentration of gaseous impurities in the furnace essentially at the concentration level of these impurities in the inert gas is also achieved in the known methods, as no impurities are generated in the furnaces and no impurities are allowed to enter the furnaces (see especially column 5, lines 33 to 46 of D1).

2. Also the apparatus of claim 17 is known from D1.

   The apparatus of claim 17 differs from the apparatus disclosed in D2 by the definition of the heater. However, it is obvious to a person skilled in the art to use a graphite resistance heater or induction heater (it is not clear from the wording of claim 17 which heater is meant here), so that the apparatus of claim 17 does not involve an inventive step in the light of the disclosure of D2 (see Article 33(3) PCT).

3. If with the "conduit" mentioned in the third line of claim 28 the unavoidable openings between the preform and the furnace are meant, then the method of claim 28 is obvious to a person skilled in the art, as it will be immediately clear to such a skilled person that the furnace disclosed in D1 can also be used for **heat-treating** a glass substrate.

   A new claim 28, specifically directed to the sealing method or apparatus depicted in figure 15, which figure shows an apparatus for performing the MCVD process,

would appear to be novel and to involve an inventive step.

4. The subject-matter of claims 2 to 16 and 18 to 27, as far as these claims can be understood, appear to be optimalisations of the known methods which come within the normal practice of a person skilled in the art, known from any of the documents D1 to D3, or made obvious by a combination of D1 and D3.

5. Concerning the clarity of the claims, reference is directed to Rule 10.2 PCT, requiring a consistent terminology throughout the application. A lot of obscurities in the claims are caused by inconsistencies in the terminology.

6. Also in the description a lot of inconsistencies in the terminology occur. For instance, the gas inlet 5a is also called a nozzle and the gas inlet piping 5b is also called a nozzle **and** a position (see the last paragraph of page 10).

   In the description and the claims wrong wording is used, which is not related to the field. For instance, the word "galvanic" is not used any more; the proper word is "electric" (see the last but one paragraph of page 10). The word "via" used in the third full paragraph of page 11 is the roman word for road (e.g. Via Appia) and thus is not appropriate, etc..

   The description is difficult to read, some paragraphs are hardly understandable or not understandable at all. It is not clear what is meant with the aggregates mentioned in the third full paragraph of page 9, as these are not specified. This makes the whole paragraph obscure. The duct flow mentioned in the last paragraph of page 9 is not specified, so that it is not clear what is meant therewith.

   It is not clear if the nozzle 6b, which is not depicted in figure 1, is for introducing gas into the furnace tube or for letting gas out of the furnace tube and into the intermediate space (see pages 10 and 11).

   The above examples are only mentioned to show the kind of obscurities occurring in the description, they are not exhaustive.

7. The features of the claims should be provided with reference signs placed in parentheses to increase the intelligibility of the claims (Rule 6.2(b) PCT). This applies to both the preamble and characterising portion.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (SEPARATE SHEET)

International application No.

PCT/FI 03/00934

Claims:

1. A method of subjecting a glass preform to processing by tensile forces in a furnace to produce a glass product of predetermined shape, according to which method

- at least a part of the glass preform is introduced into the furnace through an inlet opening,
- a portion of the glass preform introduced into the furnace is heated to a temperature above the softening point of the glass,
- the heated portion of the glass preform is subjected to tensile forces in a drawing direction to process the preform into the predetermined shape,
- the portion of the preform which has been processed into the predetermined shape is drawn from the furnace through an outlet opening, and
- the heated portion of the preform and at least a part of the processed portion of the preform are flushed in the furnace with inert gas which is being fed into the furnace,

characterized by

- maintaining the concentration of gaseous impurities in the furnace essentially on the same level as the concentration of the same impurities in the inert gas fed into the furnace,
- establishing a diffusion barrier against the inflow of undesired gaseous components from the ambient air, driven by the forces of diffusion, by generating a barrier flow of inert gas in at least one opening selected from said inlet opening and said outlet opening of the furnace, said barrier flow having a direction of flow, which is generally opposite to the direction of the diffusion.

2. The method according to claim 1, wherein the furnace comprises an elongated furnace chamber having a vertical central axis, said diffusion barrier being established in the inlet opening, which is located in the upper end of the elongated furnace chamber.

3. The method according to claim 1 or 2, wherein a diffusion barrier is established in the inlet opening of the glass preform, in the inlet opening of the inert gas feed and in the outlet opening of the processed preform.

4. The method according to claim 2, wherein there is gas flow through the inlet opening of the glass preform, which flow corresponds to the equation (2)

$$F1=F*C1/(C1+C2). \quad (2)$$

wherein
F1 stands for the gas flow through the inlet opening,
F stands for the total gas flow,
C1 stands for the conductance of the inlet opening and
C2 stands for the conductance of the outlet opening

5. The method according to claim 4, wherein the each of the conductances C1 and C2 are calculated from the equation (3)

$$C=K\ W*H^3/L, \qquad (3)$$

wherein
C stands for conductance,
K is a constant at low pressure differences,
W is the width of the opening,
H is the height of the opening, and
L is the length of the opening

6. The method according to any of claims 1 to 5, wherein there is a flow of inert gas through the outlet opening, which flow is at least equal to the flow of gas caused by the chimney effect through the inlet opening.

7. The method according to claim 6, wherein the flow of inert gas into the furnace is sufficient still to form, based on the gas distribution according to equation (2), a diffusion barrier at the outlet opening of the processed preform.

8. The method according to claim 7, wherein the outlet opening will allow for more free flow of gas than the inlet opening to direct most of the inert gas flow fed into the furnace through the outlet opening.

9. The method according to any of claims 3 to 8, wherein the conductance of the outlet opening is greater than the conductance of the inlet opening.

10. The method according to any of the preceding claims, wherein the inert gas fed into the furnace is equal to or greater than the flow of gas caused by the chimney effect + 1 SLM, in particular chimney effect + 5 SLM.

11. The method according to any of the preceding claims, wherein the glass preform is

19. The apparatus according to claim 17 or 18, wherein a nozzle for feed of protective gas is connected to both the first and the second openings and, optionally, also to an opening formed in the jacket of the furnace chamber at a point between the first and the second openings.

20. The apparatus according to any of claims 17 to 19, wherein the apparatus is adapted for heating of a glass preform subjected to drawing of optical fibre.

21. The apparatus according to claim 20, wherein the clearing between the exterior diameter of the glass preform and the first opening diameter is 0.1 – 10 mm for an 80 mm preform.

22. The apparatus according to claim 21, wherein the each barrier zone comprises a length of the furnace chamber amounting to 0.5 to 100 mm, along which a barrier flow of protective gas can be arranged.

23. The apparatus according to any of claims 17 to 22, wherein the barrier zone comprises a zone of essentially laminar gas flow.

24. The apparatus according to claim 23, wherein the barrier zone is formed above the feed nozzles of the protective gas.

25. The apparatus according to any of claims 17 to 24, wherein the barrier zone is defined by the clearance between a glass preform and the opening of the furnace.

26. The apparatus according to claim 25, wherein the difference between the external diameter of the glass preform and inner diameter of the opening is in the range of 0.5 to 15 mm.

27. The apparatus according to any of claims 23 to 26, wherein the barrier zone has a length parallel to the central axis of the furnace tube amounting to about 10 to 1000 mm, preferably about 15 to 150 mm.

28. A process for heat-treatment of glass substrates, in which method the glass substrate is placed in a first gas space of a heat treatment zone, surrounded by a second, ambient gas space, said heat treatment zone being provided with at least one gas conduit interconnecting the first and the second gas spaces, c h a r a c t e r i z e d by forming a

diffusion barrier in the at least one gas conduit interconnecting the gas space inside the heat treatment device with the ambient atmosphere to seal off the conduit against flow of gas in at least one direction through the conduit.

29. The process according to claim 28, comprising establishing a diffusion barrier against the inflow or outflow of undesired gaseous components from or to the ambient air, driven by the forces of diffusion, by generating a barrier flow of inert gas in at least one said gas conduit, said barrier flow having a direction of flow, which is generally opposite to the direction of the diffusion.

30. The process according to claim 28 or 29, comprising establishing a diffusion barrier in each of the gas conduits interconnecting the first and the second gas spaces.

31. The process according to any of claims 28 to 30, wherein the heat treatment comprises preform processing by Modified Chemical Vapour Deposition in an MCVD lathe.

32. The process according to any of claims 28 to 30, wherein the heat treatment comprises preform processing in a sintering furnace.

33. The process according to any of claims 28 to 32, wherein the diffusion barrier is established at a gas conduit comprising a rotary joint.

34. The process according to claim 33, wherein the rotary joint is a non-contacting joint.